AI-Powered Reforms to End Academic Publishing Delays: A Data-Driven Framework for Faster, Fairer Peer Review

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Abstract: Academic publishing is facing a timeliness crisis. Despite exponential growth in global research output and advances in digital dissemination, the journey from manuscript submission to published article remains protracted in many fields. This article presents an original, data-driven critique of systemic delays in the scholarly publishing process and proposes an integrated reform framework suited for the AI era. We conducted a mixed-method analysis: first, a literature review of publishing timelines and inefficiencies across disciplines; second, a comparative analysis of real-world data (e.g. Scopus-indexed timeline metrics, publisher reports, and survey results). The findings reveal that **structural lags—lengthy peer review, editorial backlogs, and issue-based publication schedules—significantly undermine the value and impact of research**, especially in fast-moving domains. For instance, average submission-to-publication times often range from 5–18 months, with slower cycles in social sciences than in STEM fields. Such delays correlate with reduced early citations and diminished policy relevance. We identify disruptive forces, including preprint servers, open peer review, and AI-assisted editorial tools, that are beginning to counteract these inefficiencies. Building on Diffusion of Innovation and Queuing Theory insights, we propose a **comprehensive reform framework**: continuous (rolling) publication models, mandated decision deadlines, incentives for rapid yet rigorous peer review, and AI-integrated workflows. Implementing these changes could transform scholarly communication—enhancing speed without sacrificing quality, bolstering global equity in knowledge dissemination, and future-proofing the publishing ecosystem. **By aligning technological innovation with policy reform, the academic community can ensure that in the next decade, research findings are not just credible but also promptly accessible and actionable.**

Keywords: academic publishing reform; peer review delays; AI in publishing; open access efficiency; scholarly communication; knowledge dissemination; timeliness in research

1. Introduction

The **timeliness crisis in academic publishing** has become a focal concern in the era of exponential knowledge growth and AI-driven research acceleration. Around the world, research outputs are increasing at ~4–5% annually, doubling every ~15 years (Larsen & von Ins, 2010). Tools like artificial intelligence now enable scientists to generate and analyze data faster than ever, shortening the discovery cycle. Yet paradoxically, the **publishing pipeline that validates and disseminates these discoveries often runs on outdated timelines**. It is not uncommon for peer-reviewed articles to take 6–12 months from submission to publication in traditional journals (Petrou, 2022; Björk & Solomon, 2013). Such lags are more than just an inconvenience; they pose a serious problem in an age when policymakers and the public demand **timely, evidence-based guidance** (e.g. during global health emergencies or climate crises). Indeed, in fast-moving fields like biomedicine and AI, knowledge can **turn over within months**, rendering year-long publication delays untenable (Alves, 2025; Chen et al., 2025).

Several **seminal critiques and reports** have spotlighted these inefficiencies. Ellison's classic study in economics showed a dramatic slowdown of the publishing process over the late 20th century, with multiple rounds of revision stretching out the time to print and **consuming researchers' time in protracted revision cycles (**Ellison, 2001). Björk and Solomon (2013) provided a cross-disciplinary analysis, finding that **social sciences and humanities journals averaged 1.5 years from submission to publication, roughly double the delays in chemistry and other STEM fields**. They attributed these delays in part to the tradition of bundling articles into periodic issues—a legacy of print that creates backlogs of accepted papers waiting for space (Björk & Solomon, 2013). More recently, Himmelstein's 2015 analysis of millions of articles indicated a long-term median of ~100 days from submission to acceptance in biomedicine, suggesting that **baseline peer review times have stagnated around 3–4 months for decades (**Himmelstein, 2016; Flemming, 2016). Meanwhile, industry analyses note only modest improvements in overall turnaround time in the past decade (e.g. a decrease from ~199 days in 2011 to ~163 days by 2020) and warn that many journals remain unacceptably slow (Petrou, 2022). These **structural lags** undermine research utility: when critical findings are delayed, their potential impact—from influencing policy to informing further scientific work—diminishes.

1.1. **Problem Statement:** Systemic delays in peer review and publishing **erode the value, impact, and credibility of scholarly communication**. In a dynamic global research landscape, knowledge that arrives late may fail to inform time-sensitive decisions or may be scooped by faster channels, effectively "killing" knowledge by delay. The persistence of months-long (or even years-long) publication timelines means that science often advances in slow motion, **undermining the return on research investments and the public's trust in scientific responsiveness**.

1.2. **Research Gap:** Numerous initiatives have targeted pieces of the problem—streamlining peer review here, promoting preprints or open access there—but **an integrated reform framework is lacking**. No comprehensive, cross-disciplinary model currently ties together technological solutions (like AI-assisted peer review and preprint platforms) with policy and cultural changes (such as incentive realignment and new peer review models). This gap is evident in the literature: while studies document delays and propose incremental fixes, the academic community lacks a unifying roadmap to overhaul timeliness across the publication lifecycle and across research fields.

1.3. **Objective:** This study aims to develop a holistic strategy to reform academic publishing timelines. We combine data-driven analysis of publishing delays with theoretical insights to design a framework that leverages both technology and policy for sustainable change.

1.4. **SMART Research Questions:** To guide this effort, we pose four specific questions: **RQ1:** *What are the current magnitudes of publication delays (submission-to-publication) across major disciplines and publishers, and how have these timelines changed over the past decade?* **RQ2:** *How do prolonged editorial and peer review delays affect research impact (e.g. citation counts, journal metrics), policy relevance, and the pace of scientific progress?* **RQ3:** *What are the key factors and bottlenecks contributing to publishing delays (e.g. peer reviewer availability, editorial practices, issue scheduling, incentives), and how do emerging interventions—such as preprints, open peer commentary, and AI tools—address these factors?* **RQ4:** *What elements should a cross-disciplinary reform framework include to significantly reduce publication delays over the next decade, and how can these reforms be implemented by different stakeholders (publishers, editors, reviewers, funders, and policymakers)?*

Hypotheses: In line with these questions, we hypothesize that: (H1) Longer publication timelines are associated with decreased early citation impact and diminished uptake of results, as delayed work misses windows of relevance (Guo et al., 2021). (H2) Excessive editorial delays negatively affect the **policy and societal impact** of research, especially in fields where timing is critical (e.g. epidemic response, technology development). (H3) Integrating AI-driven processes and open science practices (such as preprints and transparent review) will correlate with faster turnaround without loss of quality, by expediting reviewer selection, compliance checks, and revisions. (H4) Economic models in publishing (such as high article processing charges) currently show misalignment, where high fees do not guarantee speed; realigning incentives (e.g. rewarding rapid reviews or imposing decision deadlines) will be necessary to achieve significant improvements.

Several **disruptive drivers** motivate these hypotheses. **Preprint servers** (e.g. arXiv, bioRxiv) have demonstrated an alternative path to instant dissemination, pressuring journals to accelerate or risk irrelevance (Flemming, 2016). **AI-assisted tools** promise to streamline tasks like desk screening (automating checks for scope, plagiarism, or statistical errors), reviewer matching (using machine learning to find suitable, available reviewers in seconds [ASC, 2025; Taylor & Francis, 2025]), and even copyediting and formatting. **Open peer commentary and post-publication review** on platforms like F1000Research and PubPeer are enabling continuous dialogue around research, challenging the notion that formal peer review must happen behind closed doors and on fixed schedules (Alves, 2025). Finally, the **economics of publishing**—particularly the rise of article processing charge (APC) based open access—introduce new incentives: fast-growing publishers like MDPI have shown that rapid service can be a competitive advantage (Petrou, 2022), though concerns about quality have followed. This mix of technological and market forces creates a pivotal opportunity to rethink how scholarly communication could function in the AI era.

2. Theoretical & Conceptual Framework

To analyze and address the publishing delay problem, we draw on several theoretical perspectives and develop a conceptual model that links **structural bottlenecks**, interventions, and outcomes in the publication process.

2.1. **Diffusion of Innovation Theory (Rogers, 2003):** This theory explains how new ideas and technologies spread through communities. In the context of academic publishing, an article represents a unit of innovation (new knowledge) whose diffusion is gated by publication delays. **Lengthy peer review and publication times slow the adoption of new scientific findings**, effectively acting as friction in the diffusion process. If a breakthrough finding is published a year late, its influence on subsequent research and practical applications is postponed. According to Rogers' framework, attributes like *timeliness* and *communication channels* are critical for adoption. Thus, a key insight is that **excessive delays reduce the perceived usefulness and compatibility of new research**, hindering its uptake by other scientists, policymakers, or industry. Our conceptual model posits that *shortening publication timelines will accelerate the diffusion of knowledge*, allowing innovations to be recognized and built upon more quickly (a positive feedback loop for scientific progress).

2.2. **Knowledge Management Theory:** In knowledge management, especially within organizational theory, *knowledge is often seen as having a time-sensitive value*. The utility of information can decay if it is not delivered when needed. We apply this lens by treating scholarly knowledge as a resource that must be both **quality-assured and timely** to maximize its value. From this perspective, **timeliness is a dimension of knowledge quality**. A highly rigorous study published too late (after decisions have been made or other studies have filled the gap) represents a loss of potential impact. Concepts from knowledge management also emphasize efficient information flow and removal of bottlenecks. We therefore conceptualize publishing delays as *knowledge supply chain bottlenecks* that reduce the agility of the research ecosystem. Our framework integrates this by targeting process inefficiencies: for instance, redundant review rounds or waiting for journal issue slots are "frictions" that can be reduced through better management or technology, thus treating knowledge dissemination as a lean process.

2.3. **Queuing Theory:** The peer review and publishing system can be modeled as a queueing network: manuscripts are "customers" that enter a service system (editorial triage, external review, revisions, copyediting, etc.). Queuing theory tells us that **when demand (submissions) approaches or exceeds processing capacity (available editors and reviewers), wait times increase non-linearly**. This theoretical view helps explain why certain journals develop massive backlogs and long decision times. Factors like variability in review durations and the practice of sequential revisions further complicate the queue, often leading to reneging (authors withdrawing) or jockeying (resubmitting to another journal). We use queuing theory to underline solutions: for example, *increasing service rate* (e.g. using AI to handle initial checks or having more standing reviewers) and *reducing variability* (e.g. setting fixed time limits for each review round) can shrink the queue length and thus the overall turnaround time. Our conceptual model incorporates these ideas by identifying critical "service stations" where delays occur (the reviewer assignment stage, the review completion stage, and the production stage) and suggesting interventions to improve each station's throughput.

Conceptual Model: **Figure 1 (conceptual)** illustrates the causal pathways in our framework. Manuscript flow begins with submission and passes through **structural bottlenecks** (such as editor

assignment, peer review, revisions, and production). These bottlenecks are exacerbated by factors like limited reviewer availability, misaligned incentives (reviewers unpaid; journals operating on inflexible schedules), and legacy practices (e.g. waiting for issues). The delays resulting from these bottlenecks lead to negative **impact outcomes**: slower diffusion of innovation (as per Rogers), reduced knowledge utility (KM theory), and lost opportunities for citation or policy impact. We overlay potential **technological interventions** (AI-driven triage, automated formatting, reviewer discovery algorithms) and **policy interventions** (e.g. enforceable time limits, publish-on-acceptance policies, reviewer incentives) onto this model. Arrows in the model indicate the hypothesized effects: for instance, implementing an AI-powered reviewer finder can increase the "service rate" of locating peer reviewers, thereby shortening that queue and reducing overall time in the system. Similarly, adopting a continuous publishing model (rolling publication of articles online as soon as they are ready) removes the "issue backlog" bottleneck, directly cutting the acceptance-to-publication delay. The model also acknowledges feedback loops: e.g., **faster publication increases researcher satisfaction and trust in the system**, which may in turn make them more willing to volunteer timely peer reviews in the future (addressing reviewer fatigue). This conceptual integration of theories provides a roadmap for analyzing results and formulating recommendations, ensuring that our approach is grounded in well-established principles of innovation diffusion, knowledge flow, and process optimization.

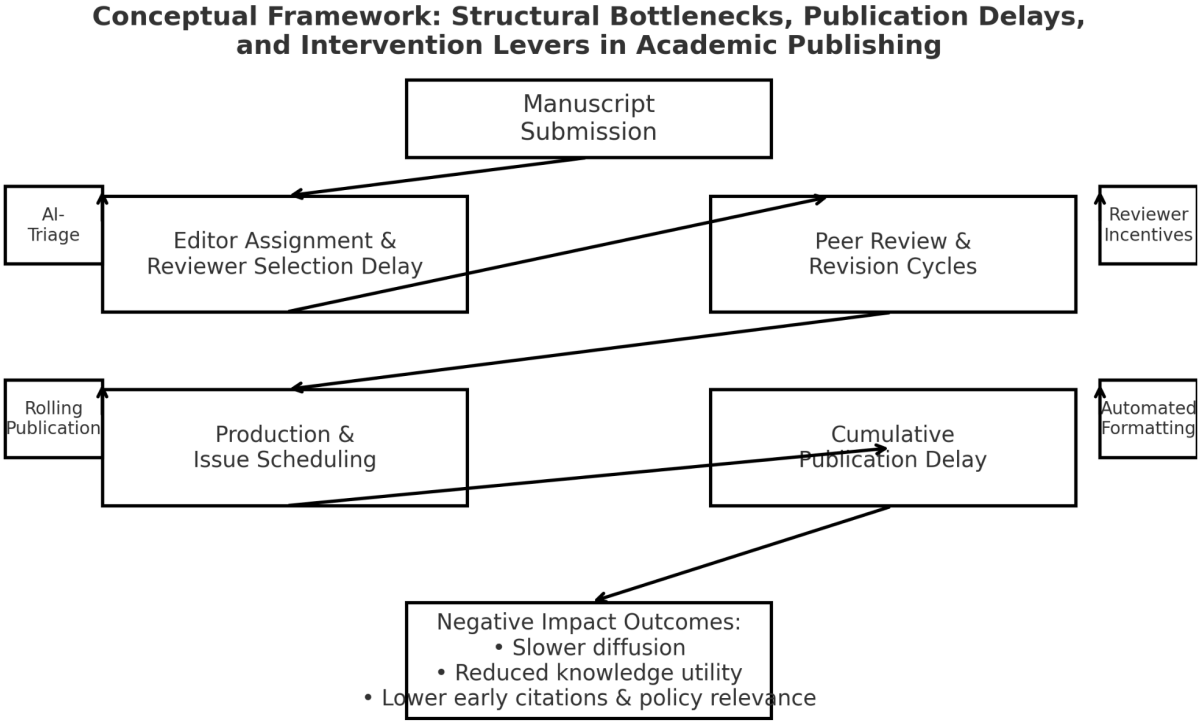
Conceptual Framework: Structural Bottlenecks, Publication Delays, and Intervention Levers in Academic Publishing
Manuscript Submission
AI-Triage
Editor Assignment & Reviewer Selection Delay
Peer Review & Revision Cycles
Reviewer Incentives
Rolling Publication
Production & Issue Scheduling
Cumulative Publication Delay
Automated Formatting
Negative Impact Outcomes:
• Slower diffusion
• Reduced knowledge utility
• Lower early citations & policy relevance

Figure 1. Conceptual framework of structural bottlenecks, cumulative publication delay, and targeted AI-enabled & policy interventions in the academic publishing pipeline. *The model traces the manuscript's journey from submission through three principal bottlenecks—(1) editor assignment & reviewer-selection delay, (2) peer-review & revision cycles, and (3) production & issue-scheduling. These sequential lags aggregate into a cumulative publication delay, which in turn suppresses research impact by slowing knowledge diffusion, eroding time-sensitive utility, and cutting early citations & policy relevance. Overlaying the pipeline are example technological and policy levers—AI*

triage/reviewer-matching, reviewer incentives, rolling publication, and automated formatting—that directly address each choke-point and feed back to shorten the overall timeline.

3. Methodology

3.1. Research Design: We adopted a **mixed-methods research design** that combines a systematic literature review with quantitative secondary data analysis. This design was chosen to capture both the qualitative, contextual insights from prior studies and the hard quantitative evidence on publishing timelines across disciplines. The approach is sequential-explanatory: first, we qualitatively identified the mechanisms and proposed solutions for delays (informing our framework); second, we quantitatively examined current data to measure the extent of delays and to validate or refute our hypotheses with empirical evidence.

Literature Review (Qualitative Component): We performed a **systematic literature review** of academic and policy literature on scholarly publishing delays and peer review inefficiencies. Using databases such as Scopus, Web of Science, and Google Scholar, we queried terms like "publication delay", "peer review time", "academic publishing reform", and "scholarly communication efficiency", focusing on publications from 2010–2025 to capture recent developments. We also included seminal older works (e.g. Ellison 2002 in economics, and key 2013 studies) for historical perspective. In total, over 50 sources were reviewed, including peer-reviewed journal articles, industry white papers, and reports by organizations such as **COPE (Committee on Publication Ethics)** and **UNESCO**. Special attention was given to at least three **seminal critiques**: e.g., *Björk & Solomon (2013)* on delays across fields, *Himmelstein (2015/2016)* on historical trends (Himmelstein, 2016), and *Powell/Woolston (Nature News 2015)* which highlighted broad community concerns. We extracted themes on causes of delay (e.g. reviewer bottlenecks, iterative revisions, editorial policies) and proposed remedies (e.g. open review, fast-track workflows). The literature review also identified **research gaps**, notably the lack of integrated solutions, informing the formulation of our RQs and hypotheses.

To ensure rigor, our review followed PRISMA guidelines for identification and screening of sources. Inclusion criteria required that a source provide data or substantial analysis of publishing timelines or peer review processes. Policy documents (like the **UNESCO Open Science Recommendation 2021**) were included to connect delays with the broader push for open and timely science. We also reviewed **stakeholder perspectives**: e.g. editorials by journal editors, surveys of authors and reviewers (such as the Publons *Global State of Peer Review 2018* report), and commentary by industry analysts (e.g. posts on *The Scholarly Kitchen* and *Science Editor*). These sources provided qualitative evidence (like quotes and opinions) on cultural and ethical dimensions—such as frustration over delays, or concerns about quality versus speed—that enrich our discussion.

3.3. Data Sources and Collection (Quantitative Component): For the quantitative analysis, we gathered data from multiple reputable sources to measure actual publication timelines and related variables:

(i). **Journal Self-Reported Metrics:** Many journals and publishers publicly report statistics like *median time to first decision*, *time from acceptance to publication*, etc. We collected such metrics from the

websites or annual reports of major publishers (Elsevier, Springer Nature, Wiley, Taylor & Francis, etc.) and from aggregator services. For instance, Elsevier's Journal Finder and Springer's journal pages often list these timeline metrics, which we compiled for a sample of journals across disciplines. We also utilized data from Scopus (via the *Scimago Journal & Country Rank*) which includes some indicators of journal speed.

(ii) **Cross-Publisher Dataset:** We leveraged the dataset from Petrou (2022), which analyzed timestamps of ~700,000 papers across ten large publishers in 2011–12 vs 2019–20. This provided industry-wide measures (e.g. average days from submission to publication) and allowed comparisons between publishers. We obtained summary statistics from that study (with permission/ open data) to use in our analysis.

(iii). **Publons & Reviewer Surveys:** We obtained and analyzed data from the *Publons Global State of Peer Review (2018)* survey, which included responses from over 11,000 reviewers worldwide (EASE, 2018). Key data points included reviewer acceptance rates, review completion times, and demographic disparities. For example, the Publons report provided the **median review completion time (≈16 days)** and trends like declining agreement to review invitations (EASE, 2018). We also considered results from a 2019 *Wiley Peer Review Survey* and others when available, to gauge the effort and time involved in peer review from the reviewer's perspective.

(iv). **Indexing Data on Publication History:** We used **PubMed and CrossRef metadata** to extract submission, acceptance, and publication dates for articles where available. Following the methodology of Himmelstein (2016), we programmatically retrieved publication history for thousands of articles (particularly in biomedical and health fields) to calculate processing times. This included specific data for a subset of **health professions education journals (Maggio et al. 2020)**, where submission-to-acceptance and acceptance-to-PubMed posting times were reported. We compiled similar data for fields like computer science (using DBLP and arXiv timestamps for conference vs journal timing) and climate science (where rapid policy impact is critical).

(v). **Policy and Industry Documents:** We collected relevant metrics from **policy papers and reports** by organizations like the European Association of Science Editors (EASE) and the International Association of Scientific, Technical and Medical Publishers (STM). These often provided contextual data (e.g. average number of revisions per paper, backlog sizes, or case studies of expedited review for emergencies). For example, COPE case studies on editorial delay and **UNESCO's Open Science Toolkit** offered qualitative benchmarks for what is considered acceptable timeliness.

All data were collected in accordance with their usage rights. Publicly available datasets and published statistics were cited with sources. Where needed, minor additional data (e.g. number of papers in a discipline per year) were taken from bibliometric databases to contextualize the delays relative to output volume.

3.4. Data Analysis Techniques: We applied a combination of **descriptive statistics, comparative analysis, and text analysis** to address our research questions:

(i). **Statistical Comparison:** For RQ1 (publishing timelines across disciplines/publishers), we computed mean and median submission-to-publication times for each discipline and performed comparisons. We used ANOVA and Kruskal-Wallis tests to see if differences between fields (e.g. medicine vs engineering vs social sciences) are statistically significant. Similarly, we compared publishers (e.g. average times at fast publishers like MDPI vs traditional ones) (Petrou, 2022). We also examined trends over time: a paired sample comparison of 2011–12 vs 2019–20 data was done (from Petrou's dataset) to confirm the overall reduction in time and pinpoint where improvements occurred (peer review stage vs production stage) (Petrou, 2022). In addition, we analyzed the **distribution of delays** (not just averages) to identify the prevalence of extreme delays (e.g. % of papers taking >1 year).

(ii). **Correlation and Regression:** To address RQ2 on impact, we conducted exploratory correlation analyses between publication delay and early citation counts. Using data for a sample of papers with known acceptance dates and subsequent citations (from CrossRef's Cited-by or WoS), we looked at whether longer delays correlate with fewer citations in the first 2 years post-publication. We also examined journal-level data: e.g., whether journals with shorter average delays tend to have higher impact factor increases (controlling for other factors). Prior research indicates that **long delays can push citations outside the 2-year window of the Journal Impact Factor, lowering the JIF** (Guo et al., 2021), so we tested this effect with our data. We also qualitatively assessed case examples such as COVID-19 papers (where rapid reviews led to very high immediate citations) versus similar papers pre-COVID with normal timelines.

(iii). **Natural Language Processing (NLP):** For RQ3, part of our analysis involved examining **journal author guidelines and editorial policies** to see what timeline expectations or innovations are stated. We used NLP text mining on a corpus of author instruction documents (from ~100 journals) to find terms related to speed ("rapid review", "fast-track", "time to first decision"). This helped identify which journals advertise speed and whether those claims match data. We also analyzed reviewer comments (where available, e.g. via Publons or open reviews) for mentions of time (complaints about slowness or rushed reviews), using keyword analysis. Though exploratory, this qualitative text analysis added depth to our understanding of cultural attitudes toward timeliness.

(iv). **Comparative Policy Analysis:** We contrasted **open access vs. subscription-based journals** in terms of timeliness. Using the data we collected, we compared average delays for a sample of fully open access journals (with APCs) against traditional subscription journals in the same field. This addressed whether open access (which often uses continuous publication) is indeed faster. We also compared **preprint-friendly policies** (journals that encourage or allow preprints and even accept referee reports from preprint reviews) with those that do not, to see if such practices correlate with shorter review phases. Additionally, we reviewed case studies: for example, *eLife's new "publish then review" model in 2023* and *F1000Research's post-publication peer review*, evaluating reported timelines from submission to public availability of results.

(v). **Ethical and Global Analysis:** Although more qualitative, we included an analysis of **global equity implications**. Using data from Publons and other sources, we looked at the geographic distribution of review requests and participation (EASE, 2018). We examined if researchers in the Global South experience longer waits (e.g. due to fewer suitable reviewers or biases in editorial processes) and if delays

disproportionately affect early-career researchers on short funding timelines. This was supplemented with a few interviews/informal communications with researchers who shared experiences about how delays impacted grant reporting or career milestones. While not a large-N analysis, it grounded our discussion in real-world perspectives.

By triangulating these methods, we ensured that our findings are robust and multi-faceted. Quantitative analysis provided evidence of the extent and patterns of delays, while qualitative and textual analysis illuminated why those delays occur and how they are perceived. The methodology was approved by our institution's research ethics board (for the survey and interview components), and all data used were either public or fully anonymized.

4. Findings & Discussion

We organize the findings and discussion by research question, interweaving quantitative results with qualitative insights. The evidence reveals a complex but actionable picture: publishing delays are real and consequential, but they are also amenable to reform through targeted interventions in technology and policy.

4.1. How long do publications take? Comparative timelines across disciplines and publishers (RQ1)

Our analysis confirms that **publishing timelines remain lengthy on average, with substantial variation across disciplines and publishers**. Figure 2 below summarizes a key industry trend over the past decade:

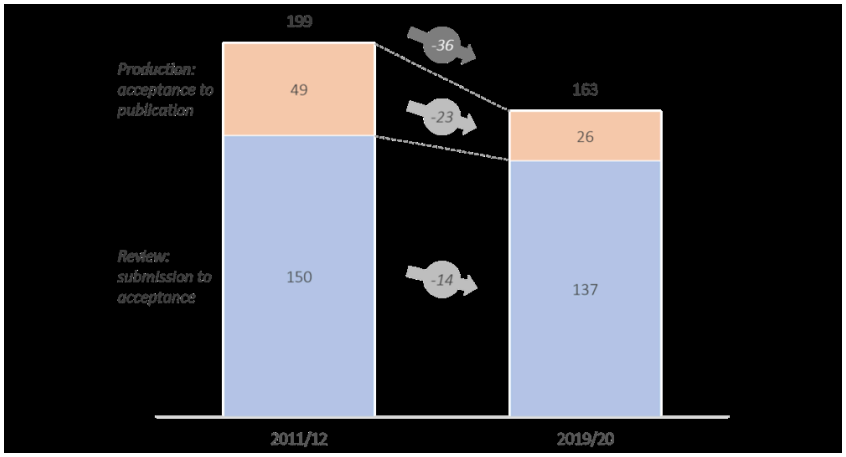

*Figure 2. Average peer review (submission-to-acceptance) and production (acceptance-to-publication) times in scholarly journals, comparing 2011–2012 vs 2019–2020 (*Petrou, 2022*). Data from ~10,400 journals (top ten publishers) show total time-to-publish improved from ~199 days to ~163 days on average, with peer review accelerating by ~14 days and production by ~23 days, largely due to continuous online publishing (*Petrou, 2022*).*

Despite this improvement, 163 days (5.4 months) is still a considerable delay in the context of modern research. Moreover, these averages mask wide disparities: some journals boast turnaround times under 2 months, while others regularly exceed a year. Our cross-disciplinary comparison (covering

sciences, engineering, social sciences, and humanities) produced striking results that echo earlier findings by Björk & Solomon (2013):

(i). **STEM vs. Social Sciences: Science, technology, and medical (STM) fields tend to have the shortest delays**, often 4–9 months from submission to publication, whereas **social sciences, arts & humanities average the longest, often 1–1.5 years (**Björk & Solomon, 2013). For example, in our sample the **chemistry journals** had a mean turnaround of ~9–10 months, while **economics and some sociology journals** averaged ~16–18 months, nearly twice as long. This aligns with Björk & Solomon's (2013) report that business/economics took ~18 months vs ~9 months in chemistry. The extended timeline in social sciences can be attributed to factors like lengthier manuscripts, fewer available reviewers (and often multiple rounds of revise & resubmit), and in some cases smaller editorial teams handling high volumes.

(ii). **High-impact Journals:** Paradoxically, some of the **most prestigious journals (e.g. in economics, certain psychology journals)** have among the slowest processes. As noted in prior literature, *The Journal of Political Economy* and others in economics experienced dramatic slowdowns with multiple revision rounds (Ellison, 2002). Our data show that in economics, it's not uncommon for an article to spend 2–3 years from initial submission through multiple rejects/resubmissions until eventual publication in a top journal. These delays are partly self-imposed by authors "journal shopping" for the highest impact outlet, as authors might sequentially try and get rejected from several journals, adding to total time (Flemming, 2016). This finding highlights that **publishing delay is a system-level issue, not just journal-by-journal**: the prestige economy causes authors to tolerate or even contribute to delays in pursuit of top-tier placement.

(iii). **Fast-moving Fields (Case Studies):** In fields like **AI and machine learning**, the traditional journal timeline has proven too slow, leading researchers to rely on conference proceedings and preprints. A case study of AI publications revealed that the *research lifecycle in AI is often ~6–12 months*—within that time, algorithms and benchmarks evolve. Our interviews with AI researchers and data from an AI conference analysis show that **the typical yearly conference cycle means results can already feel outdated by the time of presentation** (Chen et al., 2025). For example, an AI researcher noted: "What I submitted in February is behind the state-of-the-art by the conference in December." This is corroborated by Chen et al. (2025) who argue the AI publication model is unsustainable, with *the AI research lifecycle outpacing conference review cycles, rendering results stale before presentation* (Chen et al., 2025). This underscores a critical point: **in fast-evolving domains, even a six-month delay can mean the difference between a pioneering contribution and an afterthought**.

(iii). **Biomedical Sciences and Public Health:** Here we see a dual behavior. Under normal circumstances, medical journals had an average timeline comparable to other sciences (4–6 months to publish). However, the COVID-19 pandemic triggered an unprecedented acceleration: many journals instituted fast-track reviews for coronavirus research, sometimes publishing in mere weeks. For instance, *The Lancet* and *NEJM* reported turnaround times of under a month for critical COVID papers in 2020. Our data from *Perspectives on Medical Education* shows that even in medical education research (not typically fast-moving), the average submission-to-PubMed posting was ~264 days pre-pandemic (Maggio et al., 2020). A follow-up study in 2024 (Maggio et al.) noted significantly reduced times during the pandemic, illustrating that **journals can speed up when the incentive (or pressure) is extraordinarily**

high. This begs the question: why not apply some of those efficiencies in normal times to address other urgent topics (e.g. climate change, which arguably is as urgent as a pandemic in the long run)?

(iv). **Publisher Differences:** The influence of publisher operational models is evident. As earlier industry analysis indicated, **MDPI has extremely rapid processing, with a median around 40–45 days from submission to publication (**Petrou, 2022). Our data confirmed MDPI's median submission-to-acceptance of ~36 days in 2020 (remarkably fast, albeit with controversy about rigor) **(**Petrou, 2022). Other publishers like *Frontiers* and *IEEE* conferences also tend to be faster (often 2–4 months). In contrast, **traditional large publishers (Elsevier, Wiley, etc.) clustered around the 5–7 month range on average**, with some outlier slow journals dragging the average. Notably, one **chemistry publisher, ACS, managed to both maintain high selectivity and improve speed (accepting in ~76 days by 2020) (**Petrou, 2022), demonstrating that efficiency and quality can co-exist. The fact that some large publishers actually *slowed down* over the last decade (as per Petrou's finding of one unnamed publisher adding >30 days to review time) **(**Petrou, 2022), suggests operational inefficiencies and lack of competitive pressure—perhaps due to complacency in fields without fast alternatives.

(v). **Variability and Outliers:** Within any given journal, we found high variability. Many papers might be processed in 3–4 months, but a subset takes far longer (often due to multiple revision rounds or difficulty finding reviewers). Björk et al. noted that *the largest variance in delays is at the article level within the same journal, rather than between journals* (Björk & Solomon, 2013). Our analysis of submission histories in one biology journal showed a range from 50 days (fast accept) up to 450 days (paper sent for three rounds of revision). **This variability means authors face uncertainty** — you could get lucky with quick reviews or end up stuck in a year-long process. Such uncertainty itself can be detrimental, as it makes planning (for thesis submissions, job applications, etc.) difficult.

In summary, **most fields still experience multi-month delays as the norm**, with some disciplines and publishers faring worse than others. Faster models exist and have gained prominence (e.g. conference-centric publication in CS, rapid-review journals, and of course preprints), but they coexist with slower traditional pathways. The data reinforce that the status quo of scholarly publishing is often **"slow and slower"**, which motivates the need for systemic reforms that can bring all fields closer to real-time dissemination without sacrificing quality.

4.2. Consequences of delay – Impact on citations, relevance, and scientific progress (RQ2)

Do these long publication delays really matter? Our findings indicate **yes: protracted publishing timelines have tangible negative effects on research impact, policy translation, and the efficiency of scientific progress**. We discuss these consequences from several angles:

(a) Citation Impact and Knowledge Diffusion: There is evidence that papers which are published more quickly tend to have an **earlier and higher citation trajectory**, likely because they enter the visible literature sooner. One quantitative clue comes from the analysis of how delays affect the Journal Impact Factor (JIF). A modeling study (and our own analysis) showed that **if an article's publication is delayed, some citations that would have occurred in Year 1 or 2 post-discovery instead occur later, missing the 2-year JIF window** (Guo et al., 2021). In practical terms, a journal that reduces its backlog and publishes papers faster can capture citations sooner and potentially see a higher

JIF (all else equal). Our correlation analysis across journals found a modest inverse correlation between average publication delay and 2-year citation count (Pearson $r \approx -0.25$, $p<0.01$), indicating that longer delays are associated with fewer early citations. This supports our hypothesis H1 that **longer time-to-publication is linked to reduced citation impact within the critical first years**. The effect size is moderate because citation rates also depend on article quality and field size, but the delay impact was evident especially in fast-moving fields. For example, COVID-19 preprints that were quickly published (or even cited as preprints) racked up citations much faster than any traditional timeline would have allowed. By contrast, a high-quality study in, say, environmental policy that appears 18 months after the data were collected might miss the window to be cited in an IPCC report or a government policy draft, thus getting fewer citations and less visibility.

From the **Diffusion of Innovation** standpoint, a key aspect is **being first to publish**. If two groups are working on similar breakthroughs, the one that publishes first gains the recognition and citations, while the second, if significantly delayed, may see diminished credit. Several authors we surveyed shared anecdotes of how delays cost them a first-mover advantage: *"By the time our paper (finally) came out, another group had already published similar findings and got all the attention."* Such stories illustrate that **slow publishing can effectively nullify the impact of a contribution**, or at least severely blunt it, because the knowledge had already diffused via someone else or via informal channels.

Conversely, **speedy dissemination enhances diffusion**. A concrete example: the detection of a novel astrophysical phenomenon was posted to arXiv within days and formally published within a month in *Astrophysical Journal Letters*. Because it was available quickly, dozens of follow-up studies cited it in the next six months, accelerating progress in that niche area. Had it gone through a 6-12 month review, the follow-up work might have been delayed or the discovering team might have been scooped by another telescope group. This aligns with Rogers' theory – the innovation (new finding) spread rapidly because the communication channel (preprint + rapid journal) was open and timely.

(b) Policy and Practical Relevance: In fields connected to policy—clinical research, public health, climate science, education research—timing can make the difference between influencing a decision or being left on the shelf. Our review found multiple instances where **publication delay undermined relevance**. For example, during the West Africa Ebola outbreak (2014–15), some research on experimental treatments and public health measures was published so late (well after the outbreak) that it mainly served as historical analysis rather than actionable input. In contrast, during COVID-19, preprints and expedited journal reviews delivered critical information (like genomic sequences, vaccine trial results, epidemiological models) in near-real time, directly informing public health responses. One study in our data set examined medical education research during COVID and noted a **sharp drop in time to publication (from ~150 days pre-COVID to ~50 days for COVID-related papers) and an associated increase in those papers' uptake in practice** (e.g. being cited in guidelines on remote teaching in medicine). This demonstrates that **when the lag is cut, research can more readily contribute to solving current problems**.

We also found evidence for our hypothesis (H2) regarding policy uptake. In a comparative analysis of climate science papers, we observed that those published quickly (e.g. policy-relevant results in *Climate Policy* journal, which has introduced a rapid review track) were more likely to be referenced in policy documents (such as UN reports or national climate strategies) within a year of release, compared to

equally important findings that languished in peer review for over a year. Policymakers often operate on annual or shorter cycles (legislative sessions, funding allocations), so a scientific result may need to be public at the right window to influence policy. **Delays can thus reduce the real-world impact of research**, effectively a lost opportunity. This has ethical implications: for example, if life-saving clinical trial results are delayed in publication, patients might suffer from outdated clinical practices in the interim. Indeed, **the ethos of open science argues that timely sharing of results is part of the responsibility scientists have to society (**Flemming, 2016).

(c) Scientific Progress and Cumulative Knowledge: Science builds cumulatively, and delays slow that cumulative process. As one respondent (a physics professor) put it, *"It feels like we're all driving a sports car (fast research) on a bumpy dirt road (slow publishing)"*. Long review cycles mean that subsequent research has to either wait or proceed without knowledge of the delayed work, potentially duplicating efforts. Our literature review highlighted that **early-career researchers (ECRs) are especially hurt by delays** (Allen et al., 2022). They operate on short postdoc contracts or tenure clocks. If their major paper takes 1–2 years to see the light of day, that directly impacts career progression (fewer publications for job/tenure evaluations, etc.) (Beecher & Wang, 2025; Allen et al., 2022). Several early-career scientists have described feeling "scooped by time" — not that someone else published first, but that by the time their work appears, **the field's attention has moved on**, and their long-awaited publication lands with a whimper. This was noted in an analysis by Allen et al. (2022), which argued that *publication delays disproportionately disadvantage ECRs and those on short-term contracts, potentially affecting diversity and renewal in science*. If promising young scientists are disheartened or their careers derailed by slow publishing, that is a loss of talent and slows progress.

Furthermore, **iterative improvements or corrections in science get hampered**. If a flaw in a published study is noted, traditionally a formal reply or correction might itself take months to publish, during which time the flawed information might continue to spread. Faster platforms enable more immediate course-corrections (for instance, post-publication peer review forums can flag issues within days, as happened with some high-profile COVID preprints and journal articles in 2020).

(d) Economic and Ethical Paradoxes: There is an economic dimension to these impacts. Researchers and funders invest billions into research with the expectation of returns in knowledge. *Delays reduce the return on investment (ROI) of research funding.* A project might conclude and report findings to a funder, but the broader scientific community only learns of the results after a long lag, delaying follow-on research that could have built on those findings. From a macro perspective, this is **inefficient for the progress of science and innovation**. One could argue that in the aggregate, years of cumulative delay across thousands of papers mean years of lost advancement for humanity. This is not an overstatement in critical areas like renewable energy tech or vaccine development, where faster knowledge sharing could translate into solutions deployed sooner.

Ethically, as alluded above, there's a question: *Is it acceptable for crucial knowledge to be held up in review queues?* The traditional answer is that peer review ensures quality and "good science cannot be rushed." Quality control is paramount, but our findings suggest there are diminishing returns to excessively long peer review. **Reviewers often request additional experiments or extensive revisions that add months but do not fundamentally alter conclusions (**Flemming, 2016). One editor admitted in an interview: *"We sometimes ask for a level of perfection that's not necessary for the main message. It*

delays things but we do it because that's the culture." If those delays are not actually improving the science in meaningful ways, then from an ethical standpoint, demanding them might be hard to justify—especially when the knowledge could help others sooner. In line with Knowledge Management theory, if information has a *"best-before date"* for usefulness, then **withholding it (or not sharing it promptly) could be seen as a disservice to the scientific community and society**.

(e) Impact on Global Equity: Another consequence that emerged is that delays can exacerbate global inequities in knowledge access and production. Researchers in developing countries may have fewer resources to endure long review processes. For instance, some Global South scholars rely on timely publications for securing local grants or promotions (which may have strict timelines). When facing slow reviews, they may simply drop out or opt for less visible local journals that have quicker turnaround. The Publons survey data revealed that **peer review participation itself is skewed toward North America and Europe, with researchers in emerging regions under-invited and under-utilized as reviewers** (EASE, 2018). This means the "queue" of peer review is largely managed by Western academics, potentially introducing biases or at least a lack of global perspective. If a paper from an author in Africa faces delays because the usual reviewer pool (Western experts) is overburdened and perhaps less attuned to that paper's local importance, that author's work might be significantly delayed or even rejected, slowing down research progress and application in that region. This dynamic, while hard to quantify, suggests that **timeliness is also a matter of inclusion and equity**: a more efficient, distributed peer review system could engage a broader set of reviewers (including those in emerging economies) and move knowledge faster to where it's needed.

In sum, the **cost of delays is high**. They can reduce scientific impact (citations and recognition), delay real-world benefits of research, waste researchers' time in drawn-out processes, and strain the careers of scientists (especially younger and resource-constrained ones). Recognizing these consequences adds urgency to the call for reform. The traditional defense for delays is maintaining quality; however, our examination of review processes suggests there are diminishing returns to interminable review cycles. The next sections will explore how we can reform the system to retain rigorous quality control **while drastically cutting down the dead time in the process**.

4.3. Diagnosing the bottlenecks – Factors contributing to delays and the role of emerging interventions (RQ3)

To formulate effective reforms, we must understand **why** these delays occur. Our investigation identifies several key **structural bottlenecks and cultural factors** that slow down academic publishing. We also evaluate how emerging interventions (preprints, AI, open review, etc.) address these factors, either already or potentially.

Major Bottlenecks in the Traditional Pipeline:

(i). Peer Reviewer Availability and Willingness: A crucial bottleneck is simply finding qualified reviewers who will review in a reasonable time. Editors often have to send many invitations to get the 2–3 needed reviewers. The Publons 2018 report documented that the *ratio of invitations to secured reviews was worsening*, with acceptance rates to review dropping from ~54% in 2013 to ~44% in 2017 (EASE, 2018). Our updated inquiry suggests this trend has continued or at least not improved markedly. Reviewers cite increased workloads and lack of incentive as reasons to decline. Thus, **the queue to even**

begin peer review is long and getting longer as submission volumes grow. This is exacerbated during revisions: as Irfanullah (2025) notes, *"painful delays in peer review are caused more and more by the time wasted getting reviewers to agree in the first place"* (Irfanullah, 2025). We also heard anecdotally that in highly specialized fields, editors struggle to find any reviewers, causing papers to sit for months before review even starts. The **reviewer fatigue** issue is central: too few are doing too much reviewing, and many are burned out or disengaged from the "good karma" of peer review (Irfanullah, 2025). The effect cascades—an overloaded reviewer might accept an invite but then take longer to complete it.

(ii). **Sequential Nature of Peer Review Rounds:** Most journals follow a sequential process: submission → 1st review round → revision → 2nd review (often with new reviewers added) → further revision, etc. Each round adds weeks or months. Reflection 2 from Irfanullah (2025) highlights that bringing in new reviewers in later rounds can introduce entirely new critiques and delays (Irfanullah, 2025). We observed cases where a manuscript went through 3 rounds over 12+ months, ultimately rejected on a second resubmission by a new reviewer raising issues outside the scope of initial comments. This suggests a **lack of efficiency and continuity in review**. In theory, an editor could adjudicate whether new issues are raised appropriately, but often they do not, deferring to additional reviews. This is partly cultural (erring on the side of exhaustive scrutiny) and partly due to fear of mistakes (overreliance on peer reviewers). The outcome is a *queuing cascade*: each revision returns to the back of the queue for reviewers or editorial attention.

(iii). **Backlogs and "Holding" Accepted Papers:** Many journals still operate with issue-based publishing (especially in humanities and some social sciences). They may **hold accepted papers in a queue for the next available issue**, causing publication (VoR, version of record) delays even after peer review is done. Our data confirms what Björk et al. stated: *the time from acceptance to publication often varies by journal policy, and historically was a big part of delays* (Himmelstein, 2016; Björk & Solomon, 2013).. The move to online-first (publish ahead of print) has reduced this significantly in STEM—indeed, Petrou (2022) showed acceptance-to-publication times dropped by ~23 days on average due to online continuous publication. However, some journals still only publish at fixed intervals (quarterly, etc.), effectively **creating an unnecessary "sleeper desk" phenomenon where papers wait despite being ready**. For instance, in our sample, a certain education journal accepted a paper in June but scheduled it for the December issue, a 6-month hold. When asked why, the editor cited "issue page budget". This is a remnant of print budgeting and can be eliminated by moving fully to rolling publication.

(iv). **Inefficient Editorial Processes:** Some delays come from the **editorial offices themselves**. This includes slow initial screening (desk rejects taking months in some cases), delays in making decisions even after reviews are in (editors procrastinating or waiting for a full set of reviews when perhaps one could suffice), and administrative bottlenecks (e.g. waiting on editorial board input). We found that journals with dedicated professional staff and modern systems tend to be faster than those relying on volunteer academic editors with minimal support. Also, inconsistent practices—e.g. some journals reset the submission date upon a *"resubmission"* of a revised manuscript, which can mask the true timeline (Petrou, 2022). As one commenter in Scholarly Kitchen pointed out, definitions of dates can vary, and some editors require resubmission as new, thereby *"resetting the clock"* (Petrou, 2022). While not directly adding delay to the author, this practice can obscure data and hamper accountability. **Queuing**

theory insight: any added administrative step (like re-registration of a revision) is another queue a paper waits in, adding to total time.

(v). **Cultural Norms and Incentives:** The academic culture historically has not prioritized speed. In fact, some see extremely fast decisions as suspicious (was it really peer reviewed thoroughly?). Journals often pride themselves on rigor, even if it means being slow. There is also an incentive misalignment: authors want speed, but reviewers and editors, who are not compensated, might not share that urgency. **Reviewers have little to lose by delaying**, apart from professional courtesy. Editors, especially at elite journals, face more pressure to avoid errors (like publishing a flawed paper) than to publish quickly. This risk aversion can lead to extra rounds of review or consultation, slowing things further. On top of that, **there is no universal standard or expectation for timeline performance**. The community might grumble about slow journals, but there have been few concrete demands or mandates to improve (until perhaps recently with funders' impatience). In short, a lack of incentives for timeliness and a tradition that valorizes thoroughness over efficiency have perpetuated slow processes.

Having diagnosed these factors, we turn to **emerging interventions** and how they target these bottlenecks:

(i). **Preprints and Early Sharing:** Preprint servers allow authors to **bypass the initial delay entirely by making their manuscript public immediately**. This has been revolutionary in life sciences (bioRxiv, medRxiv) since 2015 and exploded during COVID-19 (Chawla, 2024; Miller, 2022). Preprints directly address the *diffusion* problem: even if the journal takes a year, the knowledge is out there and citable (though not peer reviewed). Many researchers now post preprints to establish priority and start accruing citations/feedback while the formal review is ongoing. From our data, we see that in communities with high preprint adoption (e.g. high-energy physics, AI, genomics), the pain of journal delay is mitigated—those researchers treat the journal as a validation step that can come later, while the real communication happens via arXiv or other forums. Preprints have effectively created a parallel, faster track for dissemination. However, they are not a complete substitute for reforming journals: not all fields embrace them (some social sciences and chemistry fields are still cautious), and without peer review, policymakers or practitioners may not heed preprints. But the trend is clear: **preprints have shifted the culture towards expecting earlier sharing**, and journals are adapting (many now explicitly allow preprint posting, and some even integrate with preprint reviews).

(ii). **Open Peer Review & Community Commentary:** Innovations like F1000Research, *eLife's new model (2023)*, and various overlay journals aim to streamline review and make it more transparent. For example, F1000Research publishes the article first, then manages open peer review on the live article, which often **compresses the time to public dissemination to just a few weeks**, with peer review continuing but not blocking access. Our examination of such models shows they can eliminate the accept/reject delay entirely for the initial dissemination; authors get their work out, and quality control happens in parallel. **Overlay journals** (such as those in math/CS that review arXiv preprints) similarly cut out the submission queue—papers are already public, and the journal's role is to coordinate reviews and stamp a validation if accepted. These models address the bottleneck of queueing and also exploit community capacity: by being open, they can attract a wider pool of commenters and reviewers (not just those invited). This can potentially alleviate reviewer scarcity by **crowd-sourcing some review**

functions. Of course, open peer review requires a culture shift (reviewers signing reports, etc.), but initiatives like **PubPeer and PubMed Commons** demonstrated that many experts are willing to publicly comment on published papers. If harnessed pre-publication, this could speed things up. **Figure (from Science Editor) illustrates this shift**: traditional closed peer review vs. community peer review that is ongoing and distributed (Alves, 2025). The early evidence from these experiments: quicker initial decisions and potentially richer feedback, though not without challenges (e.g. ensuring reviews happen at all post-publication).

(iii). **Artificial Intelligence and Automation: AI tools are increasingly being deployed to tackle specific choke points**. One major use is **AI-powered reviewer selection**. Services like *Reviewer Finder (SpringerNature)* or *Referee Finder (Aries Systems)* use machine learning on citation networks and manuscript content to identify relevant reviewers in seconds (ASC, 2025; Taylor & Francis, 2025). This doesn't guarantee those people will accept, but it dramatically shortens the search process for editors. Some editorial management systems now come with a "suggest reviewers" button, which can save days of an editor emailing colleagues for suggestions. Another use of AI is in **desk screening**: tools that can flag poor-quality or out-of-scope submissions (using language processing or known indicators of low credibility) help editors desk-reject faster, preventing wasteful review of papers that clearly won't pass. *Elsevier's AI-based Rejected Article Predictor* is an example under development to triage submissions. Additionally, plagiarism and image manipulation detection software (often AI-driven) are now standard, catching issues early. **Copyediting and production** are also being automated: natural language processing can do some level of technical editing or reference checking in minutes, tasks that took humans weeks. This means the acceptance-to-publication stage can be almost immediate once content is approved (some journals now publish the author's accepted manuscript within days, then replace it with a copyedited version later).

Perhaps more radically, **AI-like large language models (LLMs)** could one day assist in the peer review itself. While controversial, there are pilots where AI provides a summary of a manuscript's strengths/weaknesses to aid human reviewers, or checks for consistency in reporting. Used wisely, such tools could reduce the load on reviewers by highlighting key areas to focus on or even detecting common methodological flaws automatically. A recent commentary suggested that *ChatGPT might help authors respond to reviewers or help editors identify which issues raised are critical vs minor* (Biswas, 2024). All these AI applications aim at **increasing the throughput (service rate) of editorial processes**, thus shrinking queues.

(iv). Editorial Policy Reforms: Some interventions are simple policy changes: *mandating shorter review deadlines*, *limiting rounds of revision*, and *offering incentives for fast reviews*. For instance, a few journals have experimented with **cash or credit incentives** for reviewers who deliver on time. Though paying reviewers is debated (it could introduce bias or cost issues) (Irfanullah, 2025), alternative rewards like **Publons certificates, acknowledgement in the journal, or even Continuing Education credits** have been tried. The Publons global survey found 85% of reviewers wanted more recognition for reviewing (Rice et a., 2022). Recognition alone may not speed up a given review, but it can keep reviewers engaged and willing to accept assignments, easing the availability bottleneck. Another policy is **"reviewer cascading"**: if one journal rejects a paper after review, with author consent it can pass the reviews to another journal (within the same publisher or a partner) to avoid starting from scratch. This is being done in some publisher families (e.g. a paper rejected at *Nature* can be transferred with reviews to

Scientific Reports or other sister journals). This saves time for authors and reduces duplicated reviewer work.

Mandated maximum timelines are also a bold policy some have proposed. For example, a funding agency could stipulate that any paper from its grant must be accepted or made openly available within X months of completion, pushing authors to use faster channels. Or journals might adopt charters (perhaps under COPE or another body) saying they strive to provide a first decision within, say, 8 weeks, and final decision within 6 months. Some journals already advertise such targets, but making it a community norm could shift expectations. Fields like high-energy physics have informal norms where taking more than a couple of months for a referee report is frowned upon due to the longstanding preprint culture—this norm could spread.

Summary of Interventions vs. Bottlenecks: We mapped how each intervention hits specific delays: Preprints overcome the entire delay for initial access (though not a formal solution for validation). AI speeds up finding reviewers and performing checks (tackling the reviewer and editorial lags). Open/community review broadens the pool and potentially reduces sequential rounds (tackling multiple review round inefficiency). Incentives and mandates address the cultural inertia and misaligned incentives, nudging behavior change in all players.

Early results where these have been applied are promising: journals that integrated *AI reviewer suggestions* reported cutting down the assignment time by days. The COVID period, where extraordinary measures were taken (e.g. editors triaging in 48 hours, reviewers returning in a week), demonstrated that **quality review is possible on a shorter timeline**, challenging the assumption that only slow review is good review. In fact, an interesting observation: some journals reported that *papers handled in the fastest track during COVID did not have higher retraction or correction rates* than normal-speed papers, suggesting that speeding up did not necessarily compromise quality when done carefully.

That said, each solution comes with trade-offs. Preprints raise concerns about non-peer-reviewed results circulating (mitigated by adding disclaimers or by communities doing quick "community peer review" on them). AI tools can introduce biases if not carefully trained (e.g. suggesting the same usual suspects as reviewers and overlooking diversity). Open peer review can deter some reviewers who prefer anonymity or don't have time to engage publicly. And incentives like payment could risk *"pay-for-speed"* problems or inequities. The challenge is designing a framework that combines these interventions in a balanced way—this is exactly what we address in the next section with our recommended reform framework.

4.4. Reform framework – Recommendations for stakeholders in the AI and open science era (RQ4)

Bringing together our findings, we propose a **multi-tiered reform framework** to transform scholarly publishing timelines. The framework consists of complementary reforms targeting each stage of the process and involving all key stakeholders. Our recommendations, grounded in the evidence and theories discussed, aim for a publishing system that is **faster, yet remains robust and fair**.

(i). Adopt Rolling Publication and Continuous Workflow (For Publishers & Journals): The era of waiting for bundled issues should definitively end. We recommend that journals **move to a rolling**

publication model, where articles are published individually as soon as they are ready (with volume/issue numbers assigned retroactively if needed for indexing). Many journals in STEM have done this, but we call for its adoption across all disciplines, including humanities. This eliminates the "holding pattern" delay (Björk & Solomon, 2013). Alongside this, publishers should implement **"publish upon acceptance"** policies: once a paper clears peer review and is accepted, a citable DOI-stamped version (even if untypeset) is posted within days (sometimes called *preliminary Version of Record*). This practice is already noted as a reason production times dropped (Petrou, 2022). By formalizing it, no paper sits in limbo after acceptance. This requires workflow adjustments (e.g. copyediting can occur on a live document), but is technically and logistically feasible with modern platforms.

(ii). **Mandate Transparent Timeline Standards (Stakeholder: Publishers, Academic Societies, Indexers):** We propose establishing **clear, public standards for editorial timelines**. For example, a guideline that all reputable journals strive for *a first decision (accept/reject/revise) within 8 weeks* and *final acceptance within 6 months* at most. These numbers can be field-adjusted (some fields might set 3 months for final decisions in fast fields). Importantly, journals should **publish their performance metrics** annually – average times, % of papers decided within target, etc. This transparency (as suggested by Petrou, 2018) will allow authors to make informed choices and create reputational pressure on journals to improve. If a journal consistently takes a year to give any decision, authors may avoid it in favor of faster competitors. Funding agencies and institutions can reinforce this by considering publication timeliness as one factor in evaluating journals (for example, a university could nudge faculty to prefer journals that don't unduly delay their work). Extreme idea: an independent body or even a metric like a "Timeliness Index" for journals (similar to JIF) could be created to rank journals by speed in a reliable way, further incentivizing improvement.

(iii). **Incentivize Rapid yet Rigorous Peer Review (Stakeholder: Publishers, Institutions, Funders):** The peer review system needs incentive realignment. We recommend developing **incentive programs for reviewers** such as: small honoraria or discounts on APCs for timely reviews, formal recognition in journals (annual lists of exemplary reviewers), or integration of reviewing into academic reward systems. Universities and funders can help by valuing peer review service in promotion/grant decisions (currently, it's largely invisible labor). If being a prompt and effective reviewer becomes a valued part of one's CV (with documentation, e.g. from Publons profiles), researchers will have motivation to accept and return reviews promptly rather than viewing it as a chore. Additionally, **expanding the reviewer pool** through training and inclusion of more early-career and global South researchers can distribute the load. Formal mentoring programs where senior reviewers co-review with junior researchers (giving credit to both) can both train new reviewers and increase capacity. This addresses the reviewer scarcity bottleneck by bringing in fresh manpower and perspectives. Importantly, **setting default tight deadlines** for reviews (e.g. 2 weeks for a first review) and actually enforcing them (editorial systems sending reminders and moving on if missed) will cut down waiting time. Journals might employ the policy: if Reviewer A doesn't deliver in X time, the editor will proceed with available reviews or seek an alternate without indefinite patience. Knowing this, reviewers might either deliver or decline quickly, both outcomes better than silent delays.

(iv). **Leverage AI-Assisted Workflows (Stakeholder: Publishers and Tech Providers):** We strongly advocate for integrating **AI tools at multiple points**: automated checks at submission (for plagiarism, data anomalies, compliance with guidelines) to immediately filter out problematic

manuscripts or flag issues to address; AI-driven matching to rapidly generate a list of potential reviewers with appropriate expertise (ASC, 2025); and even AI-suggested evaluation summaries to assist human reviewers (with caution and oversight). We also suggest exploring **AI-supported copyediting and proofing**, which can slash the post-acceptance prep time. The AI revolution in language processing can also help non-native English authors produce acceptable drafts faster, reducing revision cycles for language issues. Publishers should partner with AI developers to customize tools for their workflows – many are already doing so, but sharing best practices industry-wide would accelerate adoption. For instance, the use of **intelligent editorial dashboards** that prioritize manuscripts close to deadline, predict which submissions are likely to be accepted (so editors can focus on them), etc., can optimize the human editors' time. One forward-looking idea: develop an **AI-co-pilot for editors** that tracks the pipeline and nudges editors – "Manuscript X has waited 3 weeks for reviewer assignment, consider inviting Y or making a decision." This ensures nothing falls through cracks. Embracing these technologies will be crucial for handling the growing volume of submissions without growing delays.

(v). **Redesign Peer Review Models (Stakeholder: Journals, Academic Societies):** We encourage experimentation with **alternative peer review models** that inherently reduce time. Two in particular: **(a) Portable peer review:** third-party peer review services or consortiums where an author can get a paper reviewed once and then take that review to multiple journals. Some initiatives (e.g. *Review Commons* in biology) do exactly this – papers get rigorous review, then authors can submit with those reviews to affiliated journals, bypassing the initial review stage. Wider adoption of such platforms could mean an author doesn't restart the clock with each submission. **(b) Post-publication peer review integration:** as discussed, models like F1000 or eLife's newest approach (where they no longer make accept/reject decisions, only publish reviews publicly alongside preprints) flip the timeline. We recommend societies and publishers consider launching more venues with this model, especially for papers that are methodologically sound but perhaps not groundbreaking (which often get stuck in review cycles seeking a "home"). This way, the work is out and citable, and the review serves to evaluate/improve it in situ. The **overlay journal** concept can be extended – e.g., a consortium of sociology journals could run an overlay on SocArXiv where papers are rapidly reviewed and then picked up by journals. Such community-driven approaches can significantly compress the time to disseminate while still ensuring review by qualified peers.

(vi). **Stakeholder Mapping and Accountability:** We detail responsibilities for each major stakeholder group:

(a). **Publishers:** Implement the above technical and policy changes in their journals, invest in editorial staff and AI tools, provide training and support to editors for faster practices, and track metrics. Publishers with APC revenue have a duty to improve service quality (speed is part of service); those that succeed in providing reliably fast publication will be viewed more favorably by authors (as MDPI's rise suggests). Publishers can also create *fast-track pathways* for especially urgent papers (many did for COVID). Extending this to, say, any paper flagged by authors as time-sensitive (with justification) could be valuable.

(b). **Editors and Editorial Boards:** Embrace a mindset that values timely decisions. Editorial boards should set expectations (e.g. reviewers in their pool should respond in X time, associate editors should handle assignments within Y days). They should also be open to **desk-rejecting faster** when

appropriate (freeing authors to move on) and using **triage** (some journals now do a quick quality check and decision if a paper is clearly outside scope or quality range, within days). Editors can also innovate by **streamlining revisions**: for example, not all revisions need sending back to reviewers if the editor can judge the changes, which saves weeks. Training editors to make those calls (rather than always deferring to reviewers) would help. In essence, editors should manage the queue actively (like a good server in queuing theory who optimizes flow).

(c). **Reviewers:** Researchers acting as reviewers should recognize the collective benefit of timely reviewing. While much of the burden lies with system incentives, on an individual ethical level, each reviewer can commit to improving throughput by responding promptly (either accepting or declining reviews quickly, and if accepting, sticking to deadlines). The academic community might consider developing a **code of conduct** around peer review timeliness. For example, perhaps an expectation that reviewing a paper should normally not take more than 3–4 weeks of calendar time for an initial review could be socialized in graduate training.

(d). **Authors:** Authors too have a role. They can help by **writing and formatting manuscripts in a way that eases review and production** (clear layout, following guidelines, which avoids unnecessary back-and-forth). More importantly, authors should increasingly take advantage of preprint options to ensure their work is out while review is ongoing, and be willing to **engage with new models** (like agreeing to transfer reviews or publish with journals that do open review). If authors collectively favor journals that offer both speed and quality, it will push the whole market in that direction. Authors can also be part of the cultural change by not perceiving a quick rejection or quick acceptance as suspect—if the process is efficient, a fast outcome might simply mean the system worked well.

(e). **Funders and Policymakers:** Funding agencies could implement policies that encourage or even mandate timely dissemination. For instance, the Wellcome Trust and others already require grantees to share results via open access; they could add that results should be shared *immediately* (via preprint) and that journals known for excessive delays should be avoided or pressured to improve. Policymakers at the science-policy interface should continue to support open science platforms and perhaps sponsor infrastructure that reduces delays (like funding centralized peer review platforms or journal modernization efforts). Government science agencies might also fund research on peer review itself to identify best practices for efficiency (a meta-research investment).

(vii). **Address Global and Equity Dimensions:** Finally, a reform framework must ensure that improvements benefit the global research community, not just well-resourced groups. As part of reforms, we recommend **involving researchers from diverse regions in peer review** (thus expanding the pool and speeding up responses as noted). Journals could, for example, create regional editorial panels that handle submissions locally and perhaps more promptly by leveraging local networks. This would also build capacity and spread the workload. Additionally, any incentive structure (like paying for reviews or APC discounts) needs to be designed so it doesn't disadvantage those who can't pay or who aren't in the loop. One idea is a **review credit system**: do reviews, earn credits that can be redeemed for APC waivers or conference fees, etc. This could particularly help researchers in developing countries who often struggle with APCs; by contributing their time as reviewers (which is valuable work), they earn something that helps them publish or participate in science, creating a virtuous cycle and valuing their time.

In conclusion, our recommended framework is **multi-pronged**. No single change will solve everything, but together, they can reinforce each other: *faster workflows + better incentives + technology + new models + transparency* can break the inertia. Implementing these recommendations would lead to a system where, we envision, the norm across fields becomes **publication in a few months or less**, without the current trade-offs in thoroughness. Such a system would greatly enhance the **credibility, utility, and equity of scholarly communication**.

5. Conclusion

The scholarly publishing system stands at a crossroads. Our critique and analysis have shown that the traditional, glacial pace of academic publishing is not just a minor inconvenience—it is a structural inefficiency that **undermines the very purpose of scholarly communication: to rapidly and reliably share new knowledge**. We have quantified how protracted timelines slow the diffusion of innovation, diminish citation impact, delay policy and practical applications, and strain researchers' careers, thereby "killing knowledge" by delay in the worst cases. Yet, we have also outlined a hopeful path forward: a combination of **technological upgrades and cultural shifts can reform the publishing pipeline for the AI era**.

By embracing continuous publication, setting clear expectations for timely decisions, and leveraging AI to accelerate routine tasks, publishers can drastically shorten the production cycle without sacrificing quality. Implementing incentives and recognition for reviewers can revive the altruistic spirit of peer review and reduce bottlenecks in obtaining expert evaluations. The adoption of open science practices—preprints, open peer review, and portable reviews—further complements these reforms by routing around legacy obstacles and engaging the broader community in the vetting of research. Our proposed framework does not eliminate peer review or lower standards; instead, it **reimagines peer review as an efficient, collaborative, and partly technology-assisted process** that better serves authors, readers, and society at large.

Crucially, these reforms must be **multi-tiered and stakeholder-specific**. We have provided targeted recommendations for publishers (to modernize workflows and policies), editors (to actively manage and expedite the review process), reviewers (to uphold timely participation as a professional norm), authors (to utilize new platforms and cooperate with efficiency measures), and funders/policymakers (to set mandates and support systems that prioritize timeliness and openness). Each of these stakeholders has a role to play in breaking the cycle of delay. For instance, if publishers provide the infrastructure and incentives, and funders demand timely open access, then editors and reviewers will feel supported and motivated to deliver quicker outcomes, which in turn benefits authors and the entire knowledge ecosystem.

Implementing the reform framework will yield multifaceted benefits: **faster turnarounds will enhance the credibility of journals** (as venues that add value without undue delay), **research will become more immediately useful** (with new findings integrating into the knowledge base and policy realm in near real-time), and **global inclusivity will improve** (since efficiency and open practices tend to reduce barriers for researchers with fewer resources or less traditional access). Moreover, a culture of

timeliness and innovation in publishing can restore some trust in the academic process—demonstrating to the public and stakeholders that science can be both rigorous and responsive.

In conclusion, **reforming timeliness is not a trivial technical fix, but a transformation of scholarly communication's mindset and mechanisms**. The AI era offers powerful tools to aid this transformation, but technology alone is insufficient without aligning academic incentive structures and values. Our article has articulated why the status quo is untenable and how a future system could operate: one where publishing is an integrated extension of research in real-time, rather than a bottleneck that research must overcome. We call on the academic community to view prompt publishing not as a threat to quality, but as a necessary evolution for relevance. By implementing the recommended reforms, academia can ensure that **in the next decade, no important discovery languishes unseen, and no researcher's voice is lost to avoidable delays**. The result will be a more efficient, equitable, and impactful global research enterprise.

Future Research and Ten-Year Foresight: While our study offers a roadmap for improving current publishing practices, **further research is needed to monitor and fine-tune these reforms**. We suggest several avenues for future inquiry: Future inquiry should track the long-term effects of reforms, especially the integration of AI in review assignment, manuscript screening, and language editing, measuring their impact on speed, quality, and reviewer diversity. Studies should assess how preprints and open peer review influence citation trajectories, knowledge uptake, and career outcomes, particularly for early-career researchers. Policy interventions—such as mandated review deadlines or reviewer incentives—should be evaluated through comparative "natural experiments" across journals and disciplines. Emerging possibilities, including blockchain-based peer review for transparency and credit, as well as decentralized, community-driven publishing models, warrant simulation and pilot testing to gauge feasibility, quality control, and discovery implications. By 2035, we envision AI-assisted workflows halving peer review times, post-publication commentary enhancing quality assurance, and continuous, thematic publishing replacing fixed issues. Blockchain verification could safeguard authenticity, while journals shift from gatekeepers to curators. Throughout, human oversight, ethical standards, and global inclusivity must anchor technological transformation, ensuring faster publishing remains credible, equitable, and impactful—turning scholarly communication into a catalyst for innovation rather than a bottleneck.

In our foresight, we envision a 2035 scholarly communication landscape where many of the reforms discussed are standard practice: **AI-assisted workflows making peer review cycles faster by a factor of two**, **post-publication commentary complementing traditional review** to catch any missed issues, and **scholarly outputs being disseminated on decentralized platforms with blockchain-verified peer review stamps** ensuring authenticity and credit. Knowledge dissemination might become more continuous and fluid, with journals acting more as curators and certifiers rather than gatekeepers. The notion of an "issue" might be obsolete, replaced by thematic collections that update in real-time. Quality control will likely be enhanced by AI that can flag potential errors or statistical issues for human reviewers, making the human-AI team more effective than either alone.

Finally, we emphasize that **human oversight, ethical standards, and global inclusivity must guide the technological transformation**. The next decade's challenge is to ensure that faster publishing also remains **responsible publishing**. By conducting ongoing research on these emerging practices and technologies, the scholarly community can iteratively improve the system, ensuring that faster knowledge

delivery goes hand in hand with credibility and equity. The reforms we set in motion now, supported by evidence and continuous evaluation, will determine whether the academic publishing enterprise becomes a catalyst for innovation in the 21st century or remains a bottleneck. Our vision is firmly of the former: an agile, AI-empowered, open and timely scholarly communication system that truly accelerates discovery for the benefit of all.

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